Space Weather Forecast

Issued on Monday, 01 January 2024 at 13:25 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Persistent chance of Moderate flares, and a slight chance of further Strong flares. Chance of G1-G2 Minor-Moderate storms associated with glancing CME (coronal mass ejection) influence 2nd Jan.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: High with a single strong flare from a region on the northeast limb 31/2155 UTC. There are three numbered sunspots and two small unnumbered spots on the visible disk. The most notable region is in the east. This is a moderately sized region, with a recent trailer portion emergence around the limb. The leader potion has a complex north/south alignment, leading to significant magnetic complexity. The other regions remain smaller and simpler, with the larger regions either stable or decaying.

The strong flare produced a complex CME (coronal mass ejection) with a fast central portion and a broad shockwave visible in nearly all output. Analysis of this CME is complicated by a lack of imagery, which reduces confidence, but a glancing blow looks to be possible into day 2 (02 Jan). There were several other CME's observed through the period, with a number being analysed as likely missing Earth and no significant Earth directed components identified.

Solar Wind / Geomagnetic: Background wind speeds were observed with a flat trend until around 01/1000 UTC, averaging around 310 km/s before increasing to 360-370 km/s to end the period. Interplanetary Magnetic Field (IMF), Bt, was generally weak, becoming briefly moderate around 01/1000 UTC. The north-south component, Bz, was weak. Geomagnetic activity remained Quiet (Kp 0-1).

Energetic Particles / Solar Radiation: Count rate of energetic particles (high energy protons) was mostly at background, though a minor response post strong flare was observed and is ongoing. No solar radiation Storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: The complex region on the eastern limb dominates the flare risk during the forecast period. Generally Moderate activity is expected, with further isolated Moderate flares likely and a slight chance of further Strong flares.

Solar Wind / Geomagnetic Activity: Glancing influence from the large CME (coronal mass ejection) associated with last night's strong flare possible into day 2 (02 Jan), and there are several weak, potentially glancing CMEs that may have a very minor influence later in the period. Slow wind conditions initially, with background speeds, are expected to become slightly elevated to elevated on day 1 (01 Jan) due to the onset of faster winds. Elevated winds are likely to persist day 2 before easing day 3 (02-03 Jan) in the absence of CME influences.

Overall mainly Quiet geomagnetic activity is expected to start, becoming Unsettled with a chance of Active intervals and a slight chance of G1 Minor storms later on day 1 (01 Jan). A

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chance of G1-G2 Minor to Moderate storms day 2 (02 Jan) with the potential for glancing CME arrival. This risk reducing days 3-4 (03-04 Jan), however Active intervals remain possible from any very slight CME enhancement/s that may occur.

Energetic Particles / Solar Radiation: Count rate of energetic particles (high energy protons) may respond to flares in the short term but should remain below S1 storm levels, with no solar radiation storms expected, however there remains a slight chance of breaching the S1 threshold into the period.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	50	20	10
Strong	G3	No	1	5	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X	Yes	20	20	20	20

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	20	20	20
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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